

- K. Focus eyepiece within sleeve mount so that cross-lines, located at clear central area of ground glass are sharply in focus.
1. If microscope image is in sharp focus at the film plane as viewed through the Wide Field Eyepiece, proceed to take photographs. If focus is not sharp, proceed (without 5X Adapter) as follows:

**CAUTION**

Do not disturb fine adjustment setting established in step i.

- (1) Loosen two screws (7 and 8, figure 2) which secure the two stop-plates on the Lens and Shutter Assembly. Screw (7) secures the inner plate, and screw (8) secures the outer plate.
- (2) View the image through the eyepiece on top of the ground glass, and set the 2-position lever (5) at 2.8X position to achieve the same critical focus obtained in step f.
- (3) Move the plates to the right until the left end of the horizontal slot in the inner plate touches the 2-position lever (5). Be careful not to disturb the setting of lever (5).
- (4) Tighten screw (7), again being careful not to disturb the setting of lever (5).
- (5) Set the 5X position stop-plate in a similar manner with 5X adapter in position using the outer plate and screw (8).

The setup of the microscope with the 35 mm camera is now complete. If the lever position has been adjusted for the 5X 35 mm back, no further adjustment is required for the Polaroid back. Just set lever to 5X position. If not, the same procedure should be used for the Polaroid camera setup, except for the following differences:

- a. The ground glass should be positioned with the ground surface facing upward.
- b. The 2-position lever (5) should be set to the 5X position only. Do not use the 5X Adapter.

**Use**

Taking good quality photomicrographs with the Microstar and either of the two cameras is a straight forward procedure which, if followed carefully, will result in a clear, sharp photograph with true color duplication. Although the procedure is not in any way complicated, it involves quite a number of steps. Until the procedure becomes routine, it is advisable that the operator should make a check list which covers each step of the procedure. An example of a suitable check list is shown below. A copy for reproduction is enclosed with the manual for operator use. Each step can then be checked off as it is performed, which will ensure that no steps are missed, and interruptions will not necessitate starting the procedure again.

The Exposure Table provides exposure factors and data for the more popular films, as well as variables that contribute to consistently good photographs.

To take a photomicrograph, proceed as follows:

- a. Load camera with desired film in accordance with the camera instruction manual.

**Note**

To advance film, hold black button (9) and simultaneously rotate quick change lever.

- b. Place slide to be photographed on stage.
- c. Select objective to be used.
- d. Set position of illuminator filter control lever in accordance with Exposure Table.
- e. Place desired color filter(s) for film being used on illuminator.
- f. Set transformer setting in accordance with Exposure Table.
- g. Set substage iris diaphragm to match objective being used by removing eyepiece and adjusting iris until the leaves of the iris just encroach upon the fully illuminated back lens of the objective. Make sure condenser is focused all the way up to the stop.
- h. Focus microscope for optimum clarity.

FILM FRAME NO.	EXPOSURE NO.	SPECIMEN #	OBJECTIVE	CONDENSER FILTER		CAMERA		FILTERS	CONDENSER IRIS	EXPOSURE METER	SHUTTER SPEED	SWING-OUT PRISM	TRANSFORMER	SETTING	MISC. INFO.
				IN	OUT	DS	AL								
20	1	D-201	10X							28	1/10		7.5		Focus on Cell Boundary.

## EXPOSURE TABLES

For more complete information refer to Kodak publication "Photography Thru the Microscope."

### Color Film

Kodachrome II, ASA25 (using Wratten 80B and Didymium AO No. 608 filters; transformer setting at 7.5)		
Objective	Shutter Speed Lever (5) 2.8X Position	Shutter Speed Lever (5) 5X Position With Adapter
4X	1/10	1/2
10X	1/10	1/2
20X	1/10	1/2
45X*	1/25*	1/5*
100X*	1/10-1/5*	1/2-1 sec.*

\* Illuminator built-in filter swung out.

### Black and White Films

Transformer 7.5 Panatomic X, ASA40 (58 Wratten filter)		
Objective	Shutter Speed Lever (5) 2.8X Position	Shutter Speed Lever (5) 5X Position With Adapter
4X	1/5	1 sec.
10X	1/5	1 sec.
20X	1/5	1 sec.
45X*	1/10*	1/2 sec.*
100X*	1/2*	2 sec.*

\* Illuminator built-in filter swung out.

### Polaroid Color Film

Transformer 7.5 ASA75 (filters Didymium AO No. 608 and Daylight AO No. 619)	
Objective	Shutter Speed Lever (5) 5X Position
4X*	1/10-1/5*
10X*	1/10-1/5*
20X*	1/10-1/5*
45X*	1/2-1*
100X*	1 sec.-2*

\* Illuminator built-in filter swung out.

### Polaroid Black and White

Transformer 7.5  
ASA 3000 (filter No. 58)

Objective	Shutter Speed Lever (5) 5X Position
4X	1/50
10X	1/50
20X	1/50
45X*	1/125*
100X*	1/50*

\* Illuminator built-in filter swung out.

### Other Color Films

Film	ASA	Exposure Factor <sup>f</sup>	Filters
Kodachrome X	64	2-1/2X*	80B + Didymium
Ektachrome X	64	2-1/2X	80B + Didymium
Kodacolor X	64	2-1/2X	80B + Didymium
Ektachrome B	100	4X	81A + Didymium
Anscochrome tungsten	20	1X	81A + Didymium
Super Ansco-chrometungsten	100	4X	81A + Didymium

<sup>f</sup> Exposure Factor is ratio of shutter speeds comparable to those given for Kodachrome II.

\* 1/10 with Kodachrome II would be 1/25 with Kodachrome X.

### Filter Light Values % Transmission

Kodak 80B	= 50%
Didymium (A. O. 608)	= 50%
Kodak 81A	= 30%
Kodak 81A	= 70%
Wratten #58	= 12%
Daylight (A. O. 619)	= 25%

Filtering light to produce a specific result is achievable, but it requires firm control. Usually the above filters for respective film will yield a good average result. More blue, use higher 80-81-82, for less red remove didymium.

### Note

When converting shutter speeds, intermediate speeds can often be used, i.e., 2/125 = 1/82.5; 3/50 = 1/17; 3/25 = 1/8; 3/10 = 1/3; etc.

- i. Swing out prism with lever (6).
- j. Set shutter speed in accordance with Exposure Table.
- k. Set 2-position lever (5) to 2.8X or 5X as required.
- l. Pull out dark slide (3).
- m. Trip shutter.
- n. Advance film for next exposure.

#### Notes

Always close dark slide before removing camera back from microscope.

#### MAINTENANCE

The photographic equipment will continue to give excellent performance providing care is taken in handling, and all parts are kept clean.

Always avoid touching the lens surfaces with the fingers. Fingerprints on the lens surface can seriously effect the quality of the photographs.

The exposed lens surfaces should be cleaned only when necessary. To clean the lens surfaces, proceed as follows:

- a. Blow dust particles from lens surfaces with an ear syringe.
- b. Brush surface with a clean, camel's-hair brush.

- c. Using a cotton swab (que-tip), moisten the lens surface with a weak detergent solution. Grease or oil may require use of alcohol or Xylene. Never flood with solvent. Use dampened cloth or que-tip.
- d. Wipe the lens surface with a soft, clean, lint-free cloth, a lens tissue, or a cotton tuft.

All other parts of the photomicrographic equipment should be kept clean by brushing with a camel's-hair brush.

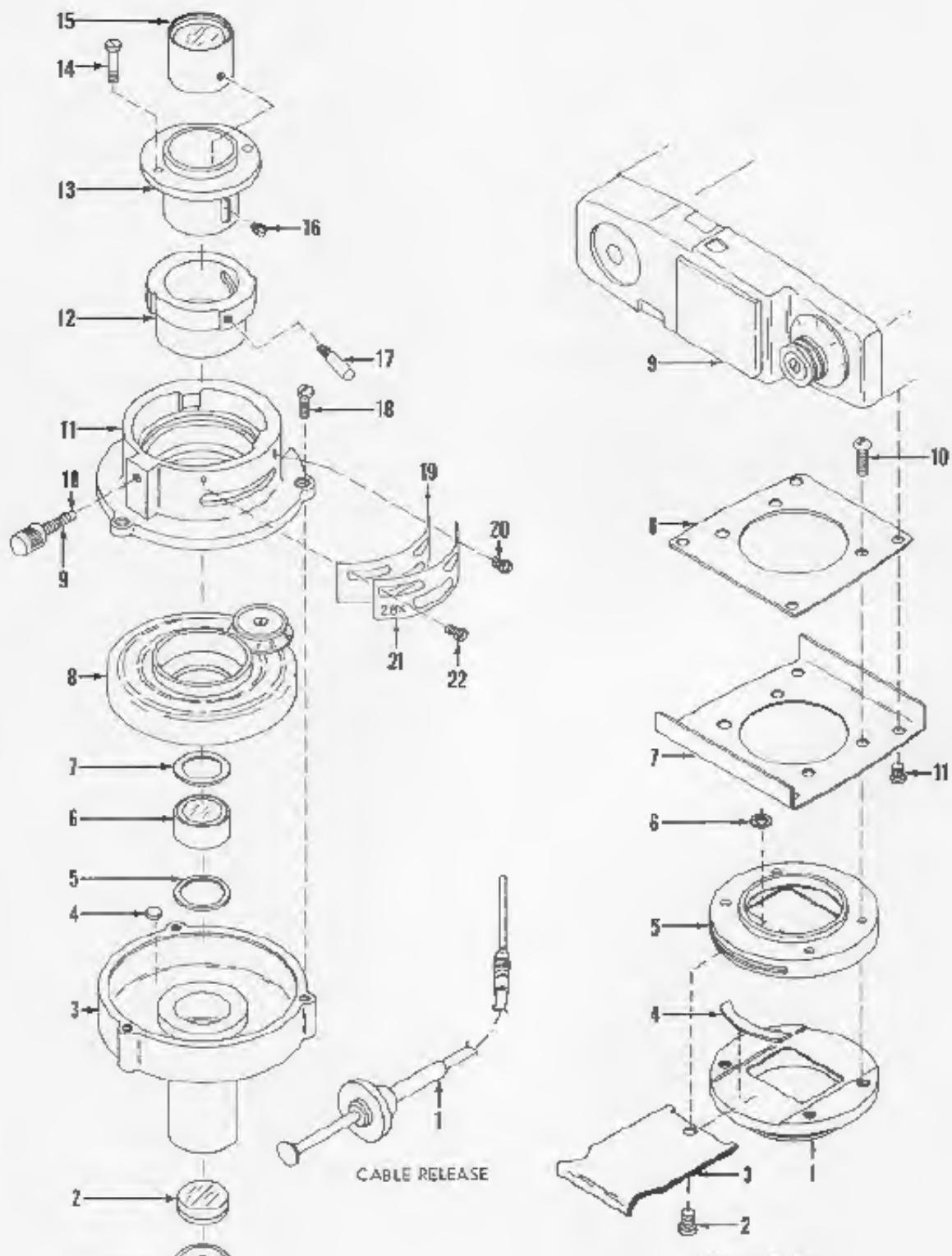
#### PARTS LIST

This section contains a listing of parts and illustrations for the AO Photomicrographic Equipment.

The illustrations are used to identify and locate parts of the Camera Backs, Cat. No. 1052 and 1053 and Lens and Shutter Assembly, Cat. No. 1057, and is keyed to the part by using the illustration. Note the index number for the part and cross-reference it to the parts list. The part number, description, and quantity required will be found opposite the index number.

In certain cases, it may be desirable to replace a complete assembly instead of overhauling or rebuilding with detail parts.

Parts or assemblies should be ordered directly from AO's Instrument Division plant at Buffalo, N. Y., or from any of AO's authorized dealers. When ordering parts, be sure to include a complete description, part number, and correct quantity.

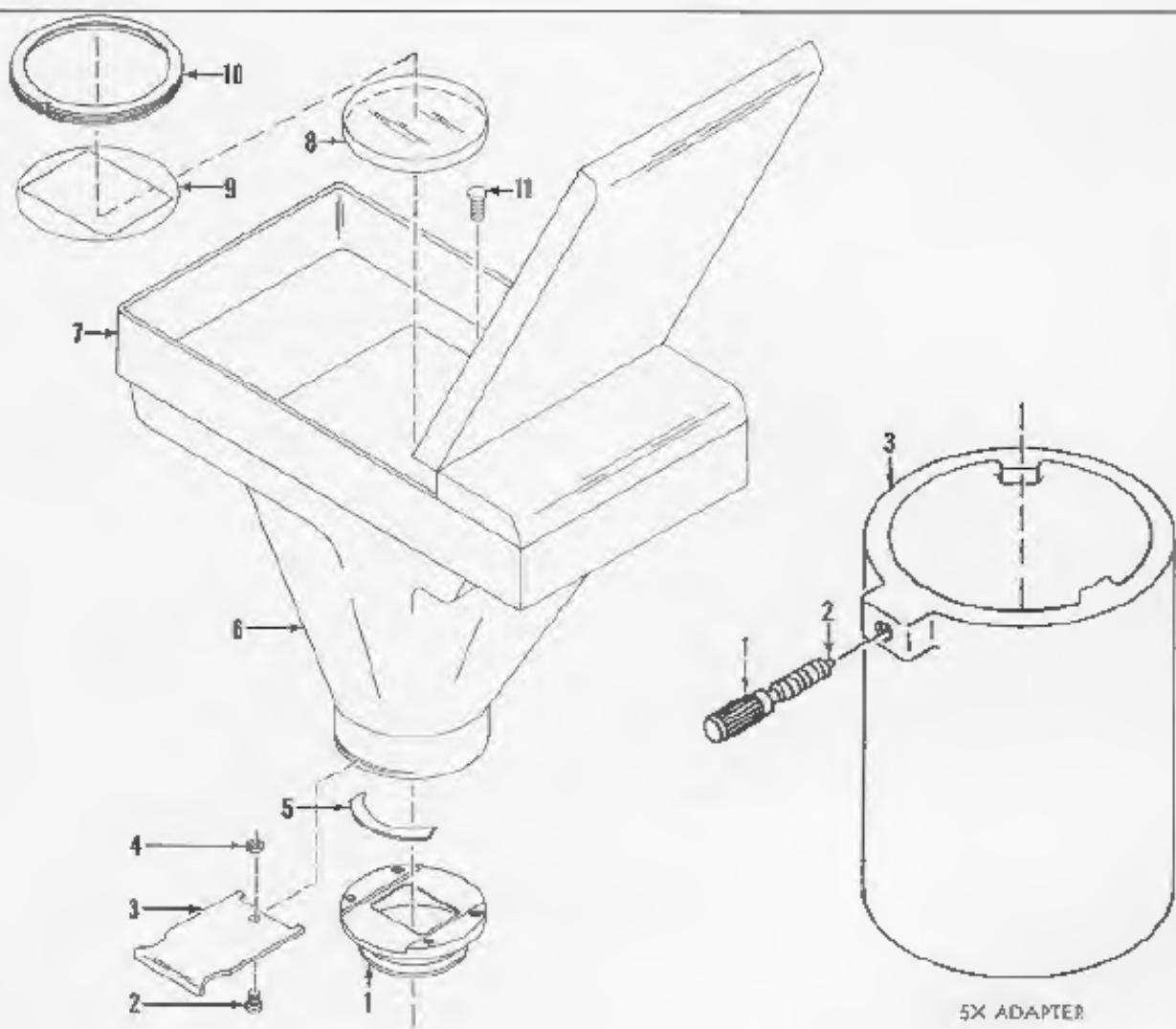


LENS AND SHUTTER ASSEMBLY

Lens and Shutter Assembly, Cable Release, and 35 MM Camera

**Lens and Shutter Assembly, Cable Release, and 35 MM Camera**

Index No.	Part Number	Description	Qty Per Assy
1	1057-801	Lens and Shutter Assembly	1
1	1057-9	Retainer	1
2	1057-701	Lens, front doublet	1
3	1057-14	Housing, lower	1
4	1057-30	Shock, rubber	4
5	02180 thru 02187	Shim	AR
6	1057-854	Middle, cell, cemented	1
7	1057-24	Disc, middle cell	1
8	1057-10	Shutter	1
9	1043-76	Screw	1
10	10-95	Tip, lock screw	1
11	1057-16	Housing, upper	1
12	1057-19	Cam	1
13	1057-18	Mount	1
14	1057-28	Screw	2
15	1057-855	Cell, upper	1
16	1057-21	Screw	1
17	1057-20	Lever, focusing	1
18	X-798-40	Screw	3
19	1057-22	Plate, inner	1
20	1057-27	Screw	1
21	1057-23	Plate, outer	1
22	1057-26	Screw	1
1	1057-29	Cable Release	1
1	1053-800	35 MM Camera	1
1	1053-2	Adapter	1
2	X-1384-1	Screw	1
3	1053-6	Stop, light	1
4	1053-8	Gasket, felt	1
5	1053-3	Mount	1
6	1053-7	Nut, stop	1
7	1053-4	Cover, camera	1
8	1053-5	Spacer	1
9	1053-1	Camera Back	1
10	X-128-1	Screw	4
11	X-30677-1	Screw	4



Polaroid Camera and 5X Adapter

Index No.	Part Number	Description	Qty Per Assy
1	1052-800	Polaroid Camera	1
2	1053-2	Adapter	1
2	X-1384-1	Screw	1
3	1053-6	Stop, light	1
4	1053-7	Nut, stop	1
5	1053-8	Gasket, felt	1
6	1052-3	Body, camera	1
7	1052-1	Back, camera	1
8	1052-601	Lens Assembly	1
9	1052-5	Diaphragm	1
10	1052-6	Retainer	1
11	X-19965	Screw	4
1	1043-76	5X Adapter	1
2	10-95	Screw	1
3	1053-11	Tip, lock screw	1
		Body, adapter	1

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# PHOTOMICROGRAPHIC EQUIPMENT

## REFERENCE MANUAL

American  Optical  
COMPANY

INSTRUMENT DIVISION BUFFALO, N. Y., 14215

Price \$1.00

FILM FRAME NO.	EXPOSURE NO.	SPECIMEN #	OBJECTIVE	CONDENSER FILTER IN OUT	CAMERA D-S A-L R-I K-D E	FILTERS	CONDENSER IRIS	EXPOSURE METER	SHUTTER SPEED	SWING-OUT PRISM	TRANSFORMER SETTING	MISC. INFO.

# EXPOSURE TABULATION

For No. 635 35mm Camera with Series 4 MICROSTAR



## COLOR FILM

†Kodachrome II with 80B Filter and Ektachrome F; ASA-12

Anscoflash; ASA-16

Kodachrome II, Prof. Type A; ASA-40

Filter	3.5X, 5X, 10X Objectives			43X Objective			97X Objective		
	ASA-40	ASA-12	ASA-16	ASA-40	ASA-12	ASA-16	ASA-40	ASA-12	ASA-16
None		2/125	1/125	1/50	3/50	1/25	1/10	3/10	1/5
82A	1/125	1/50	2/125	3/125	1/10	1/10	1/5	3/5	1/2
82C	1/125	1/50	2/125	3/125	1/10	1/10	1/5	3/5	1/2
82A or 82C plus Didymium*	1/125	3/125	1/50	1/25	3/25	1/10	3/10	1	1
82A plus 82C plus Didymium*	2/125	1/25	1/50	2/25	1/5	3/25	1/2	1-1/2	1
Cobalt**	1/125	3/125	1/50	1/25	3/25	1/10	3/10	1	1
Cobalt** plus Didymium*	2/125	1/25	1/50	2/25	1/5	3/25	1/2	1-1/2	1

\*Didymium 33mm filter 2.5mm thick (AO Cat. No. 608)

\*\*Blue 33mm filter supplied with microscope (AO Cat. No. 406)

†Kodachrome II is a daylight film. For use with tungsten sources it must be used with a No. 80B filter. Exposure times under ASA-12 for Kodachrome II are assumed to be with this filter plus other filters designated. Didymium is recommended with Ektachrome films for color and fluorescein.

## BLACK and WHITE FILM

Panatomic X and Microfile; ASA-25

Filter	3.5X, 5X, 10X Objectives		43X Objective	97X Objective
	ASA-25	ASA-25	ASA-25	ASA-25
None	1/25		1/25	1/5
58	1/50		1/10	1/2

## MISCELLANEOUS DATA

### Filter values:

82A = 1/2 stop  
 82C = 1/2 stop  
 Cobalt = 1 stop  
 Didymium = 1 stop  
 #58 = 1½ stop

# 635 35mm Camera has flex shutter with speeds T, B, 1/125, 1/50, 1/25, 1/10, 1/5, 1/2 and 1 second. To obtain additional exposure times as indicated in above tabulation proceed as follows:

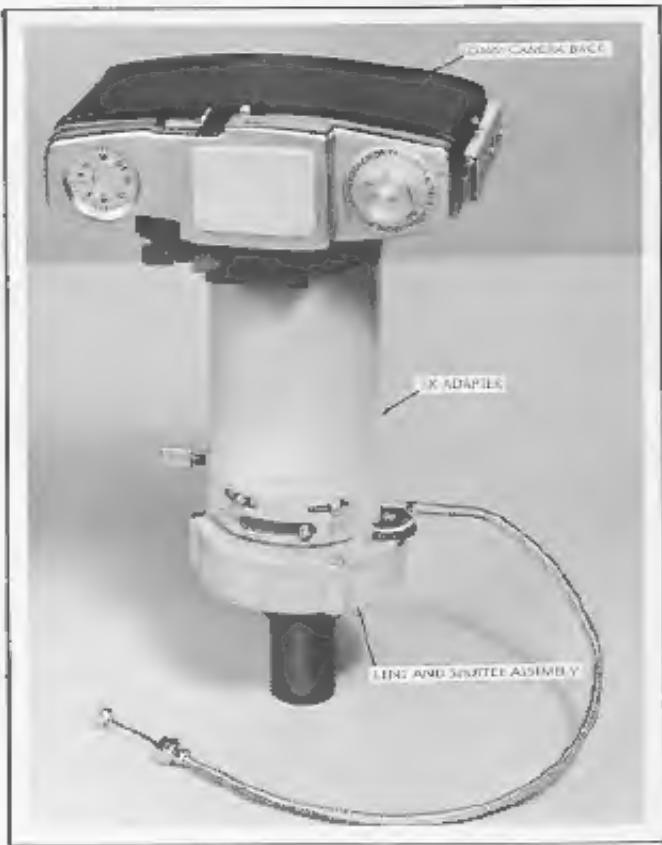
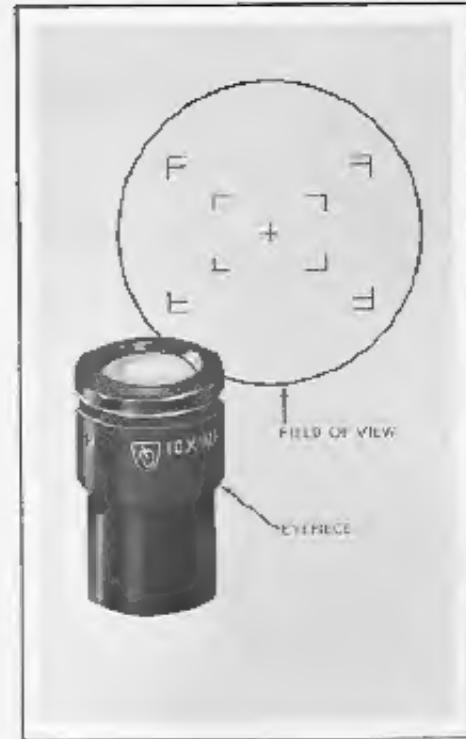
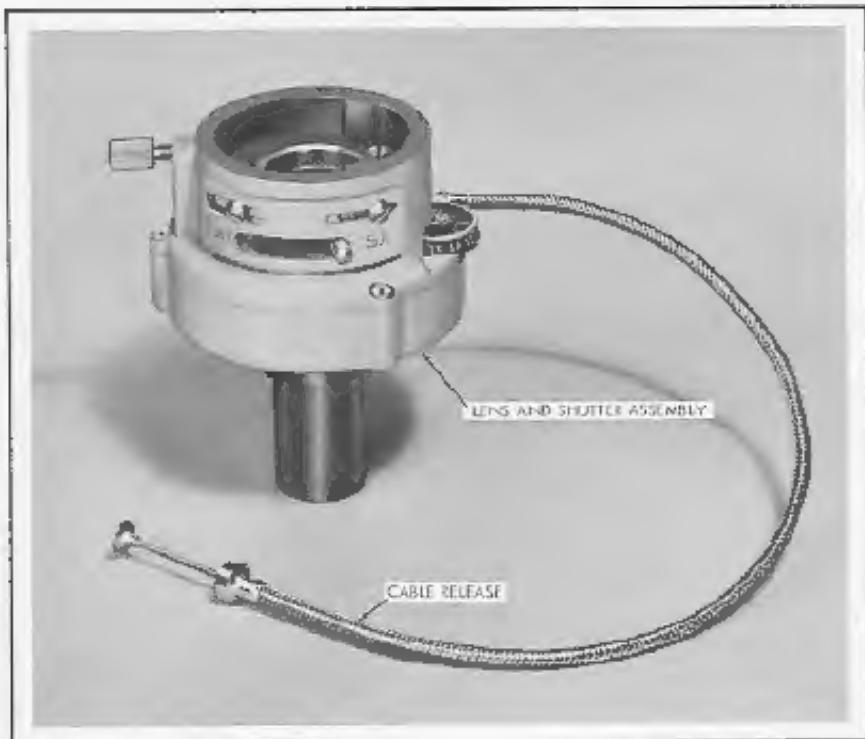
3/10 (1/3 second)	—set shutter at 1/10 and snap 3 times
3/25 (1/8 second)	—set shutter at 1/25 and snap 3 times
3/5 (1/2 second)	—set shutter at 1/5 and snap 3 times
3/50 (1/17 second)	—set shutter at 1/50 and snap 3 times
3/125 (1/40 second)	—set shutter at 1/125 and snap 3 times
2/125 (1/62½ second)	—set shutter at 1/125 and snap 2 times

NOTE: For best results check microscope and illuminator for following:

1. Transformer (#350 or 651) should be set at highest voltage position.
2. Condenser should be properly focused and lamp iris set correctly.
3. Abbe Condenser iris should be correctly positioned.



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# PHOTOMICROGRAPHIC EQUIPMENT

## INTRODUCTION

This reference manual covers the Photomicrographic Equipment produced by the American Optical Company for use with the Microstar Series 10 Microscope.

The manual is written on the assumption that the equipment is to be used by experienced microscopists, and therefore is limited to the specific equipment and does not include basic principles of photomicrography.

## DESCRIPTION

The cameras and accessories covered by this manual consist of the following:

35 mm Camera Back (Cat. No. 1053) - This 35 mm camera back is manufactured by Kodak and adapted for use with AO microscopes. The camera back is equipped with a special adapter for fitting to Cat. No. 1057 Lens and Shutter Assembly. The 35 mm camera back is equipped with a dark slide.

Polaroid Camera Back (Cat. No. 1062) - This camera back is manufactured by Polaroid and adapted for use with AO microscopes. The camera back has a special cone-shaped adapter for attaching to Cat. No. 1057 Lens and Shutter Assembly. The cone-shaped adapter is equipped with a dark slide, and has a built in compensating lens.

Lens and Shutter Assembly (Cat. No. 1057) - The Lens and Shutter Assembly consists of a lens assembly, a 7-speed shutter, a cable release, an adapter for fitting to the microscope, and an adapter with a knurled locking screw for attaching either camera back to the Lens and Shutter Assembly. The Lens and Shutter Assembly has a 2.8X and a 5X position lever. The 2.8X position is for use with the 35 mm camera back only, and the 5X position is for use with the 35 mm camera back plus a 5X Adapter, or with the Polaroid camera back.

5X Adapter - The 5X Adapter is a straight cylindrical tube for use with the 35 mm camera back when used for a factor of 5X photomicrography. The 5X Adapter is placed between the 35 mm camera back and the Lens and Shutter Assembly, and has a knurled screw for attaching it to the 35 mm camera back.

Field of View Eyepiece (Cat. No. 1054) - This is a special 10X wide field focusing eyepiece which eliminates out of focus conditions due to accommodation or refractive errors. The field of

view eyepiece, which can also be used for conventional viewing, must always be placed in the right-hand eyepiece tube. The eyepiece is equipped with reticle, which has framing marks indicating the exact image area of the specimen which will be photographed, in addition to a central focusing cross.

## SETUP AND USE

### Setup

Before photographs can be taken, the microscope and camera, or cameras, must be set up and adjusted as instructed below. Because of the differences in eyesight between various users, it is advisable to use the field of view eyepiece if more than one person is going to use the microscope for photomicrography. When the camera and microscope are setup without the field of view eyepiece, photographs should be taken only by the person who performs the setup procedure. The setup for both camera backs is very similar, and therefore, the following instructions are for setting up the microscope with the 35 mm camera back only, and the slight differences in procedure for setting up the Polaroid camera back are listed after the respective procedures.

### NOTE

If eyeglasses are used, they should be used throughout the entire procedure.

### 35 mm Camera Setup Using Field of View Eyepiece

- a. Remove photographic eyepiece tube or dust cap from microscope.
- b. Insert Lens and Shutter Assembly with the focusing lever toward the operator, and secure with knurled thumbscrew (1, figure 2).
- c. Place 35 mm camera back (with or without 5X Adapter) on Lens and Shutter Assembly with the controls facing the operator, and secure with knurled thumbscrew (2). If 5X Adapter is used, 2-position lever (5) is to be in 5X position. If adapter is not used, lever (5) is to be in 2.8X position. Select microscope objective to be used.
- d. Remove eyepiece from right hand eyepiece tube, and insert field of view eyepiece.
- e. Look through the field of view eyepiece, and set the focus by turning the top lens assembly until the cross lines in the center of the field of view are sharply defined.

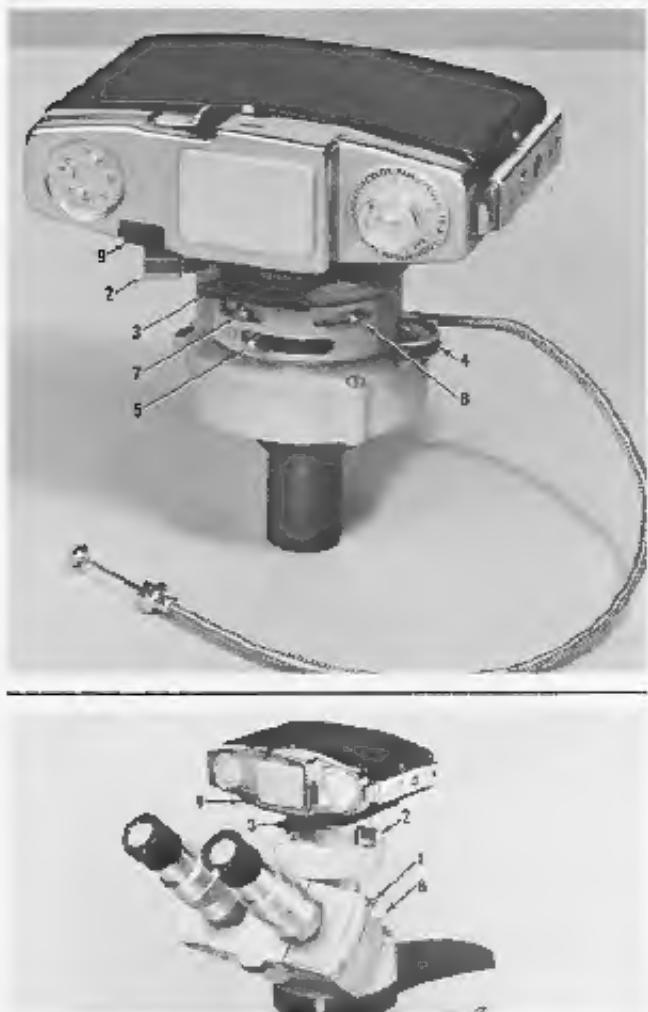


Figure 2. Microscope and Camera Setup

1. When the microscope image is sharply focused simultaneously with the cross line and the image is centered within the field of view frame, the equipment is now ready for use. Proceed to take pictures.

Polaroid Camera Setup - The setup procedure for the Polaroid camera using the field of view eyepiece is the same, except that the 5X Adapter is not used and 2-position lever (5) will always be in the 5X position.

Setup of 35 mm Camera Without Use of Field Of View Eyepiece

**Note**

This procedure need only be performed the first time the microscope and 35 mm camera are setup, and need not be repeated for subsequent setting up unless the 2.8X and 5X stop-plate settings have been disturbed or a different operator is using the equipment.

- a. Perform steps a, b, and c of above procedure.

- b. Select the lowest objective (4X; if 4X is not available, use 10X).
- c. Place a slide that can be critically focused for fine detail and minimum depth on the stage.
- d. View the image through the right hand eyepiece, and focus by using the fine adjustment. Then, bring left eyepiece image into sharp focus with tube adjustment.
- e. Refocus ten times and note the reading on the fine adjustment drum each time. Calculate the average of these ten settings.
- f. Set the fine adjustment to the average reading obtained in step e. Avoid any contact with the equipment that would disturb focus established above. This setting must be maintained while carrying out step l.
- g. Open camera back, and place ground glass over film aperture at film plane with ground side of glass facing down. Pull out dark slide (3) and set shutter speed adjustment (4) at "T." Open shutter using cable release.
- h. Set 2-position lever (5) on Lens and Shutter Assembly to the correct setting.
- i. Swing out prism with lever (6) to direct light to the camera.
- j. Insert Wide Field Eyepiece into sleeve mount as shown in figure 3a. Place this combination on ground glass with the fibre collar down as shown in figure 3b.

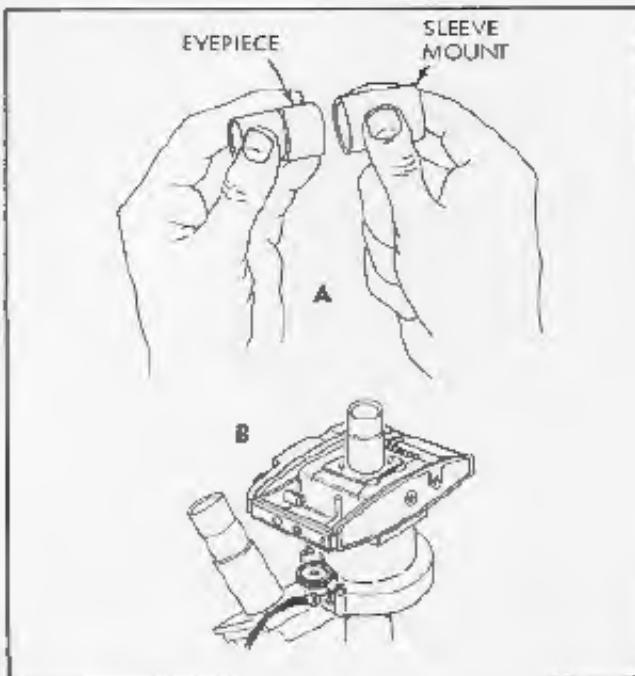


Figure 3. Focusing Sleeve Mount